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ABSTRACT

This document features descriptions of interactive learning models and presentations in environmental education concerning groundwater, geology, the environment, weather, water activities, and interactive games. Activities include: (1) GW-Standard; (2) GW-w/no Leaky Underground Storage Tank (No UST); (3) GW-Karst; (4) GW-Landfill Models--Standard (Underground); (5) Groundwater Well Cut-Away; (6) Porosity Tanks (Bottles); (7) EnviroScape w/Groundwater Add-on; (8) Earthquake Tank; (9) Edible Geology (Cake--Faults and Folding); (10) Volcano Demonstration; (11) EnviroScape-Standard; (12) EnviroScape-Hazardous Waste; (13) EnviroScape-Landfill (Surface); (14) EnviroScape-Riparian Add-on; (15) EnviroScape-Wetlands; (16) Wetlands-In-A-Bottle; (17) Wetlands-In-A-Pan; (18) Instant Snowstorm; (19) Weather Demonstration (Tornadoes, Lightning, Thunderstorms, Flooding); (20) 21st Century (Working Reservoir); (21) Water Witch (Water Use, Recycling and Reuse, Water Conservation); (22) Hydro-Explorer (Computer Game--Household Pollution); (23) No-KNOW (Board Game--Surface Pollution); (24) SPLASH (Computer Game--Surface Pollution); (25) Blue Lagoon (Discussion/Participation re: Water Management); (26) Pass-The-Jug (Water Rights and Allocation); (27) Hydraulic Research Laboratory Tours; (28) Storm Drain/Curb Stenciling Program; (29) Classroom Visits; (30) Partnership School Program; (31) Teacher Training Interactive Learning Model and Display Loan Program; (32) Water Festivals; and (33) Special Events (i.e. State Fairs). (CCM)

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Environmental Education Activities & Programs

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ENVIRONMENTAL EDUCATION PROGRAM

Activities & Programs

1998-1999

ENVIRONMENTAL EDUCATION PROGRAM

DESCRIPTION OF ACTIVITIES

1998-1999

For further information please contact:

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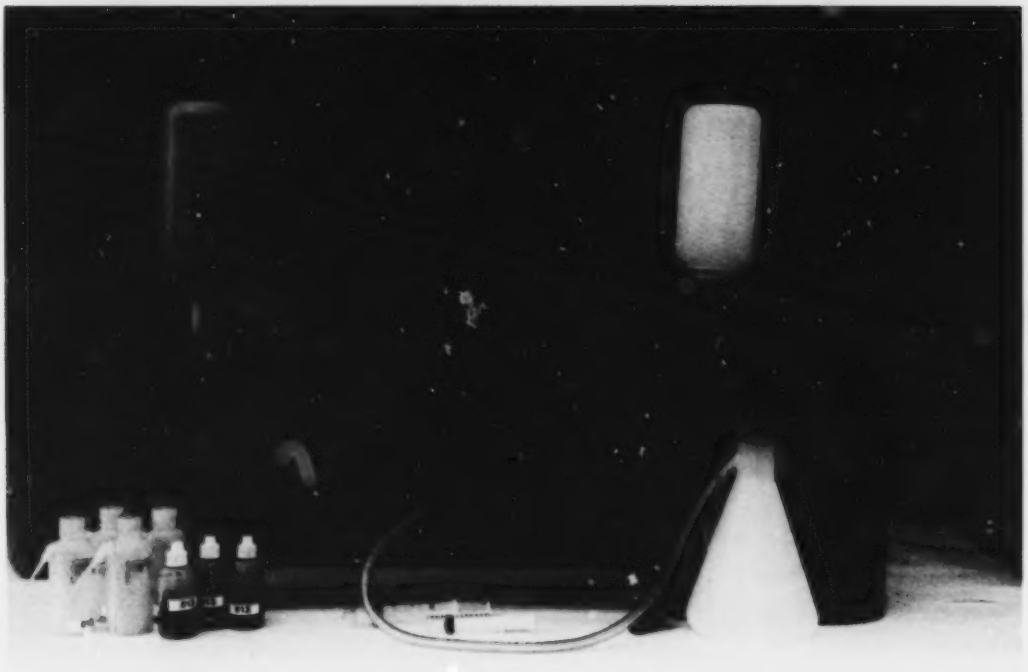
INTERACTIVE LEARNING MODELS AND PRESENTATIONS



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GROUNDWATER MODEL
STANDARD

Description:

The 'Standard Groundwater Model' (GW Model) is a representation of a vertical 'slice' of the earth in a 'typical' continental or inland environment. It consists, from the bottom up, of a confined or artesian aquifer, a confining layer, and an unconfined aquifer. It includes a representation of a lake or river, a surface point source for contamination, a buried storage tank that leaks, and four types of wells (observation wells, pumping wells, artesian wells, and injection wells).

The GW Model is used to illustrate up to 27 groundwater concepts, including how the water is stored in the ground, moves through the ground, how it gets into or leaves the ground and how it gets contaminated in the ground. The model also illustrates several technologies for cleaning or removing the contamination from the water and aquifer materials, and presents some ideas about preventing contamination and water conservation.

The demonstration consists of filling the model with water, injecting food coloring at various points in the model, and then extracting the water and coloring from the model by using a hand pump connected to one of the pumping wells. By following the flow of the food coloring through the model, the audience can see how water flows through the ground, how contamination gets into the water and moves with it, and how fragile and interconnected the groundwater system really is.

The demonstration and the concepts illustrated are related to common, everyday events and household practices. The demonstration is interactive with the audience in that the audience does the pumping, gets to add coloring in response to questions, and answer their own questions by doing an experiment that illustrates the concept behind their question.

Typical Audience Size:

5 - 8 students/audience in a water festival setting
10 - 15 students (maximum) in a classroom setting

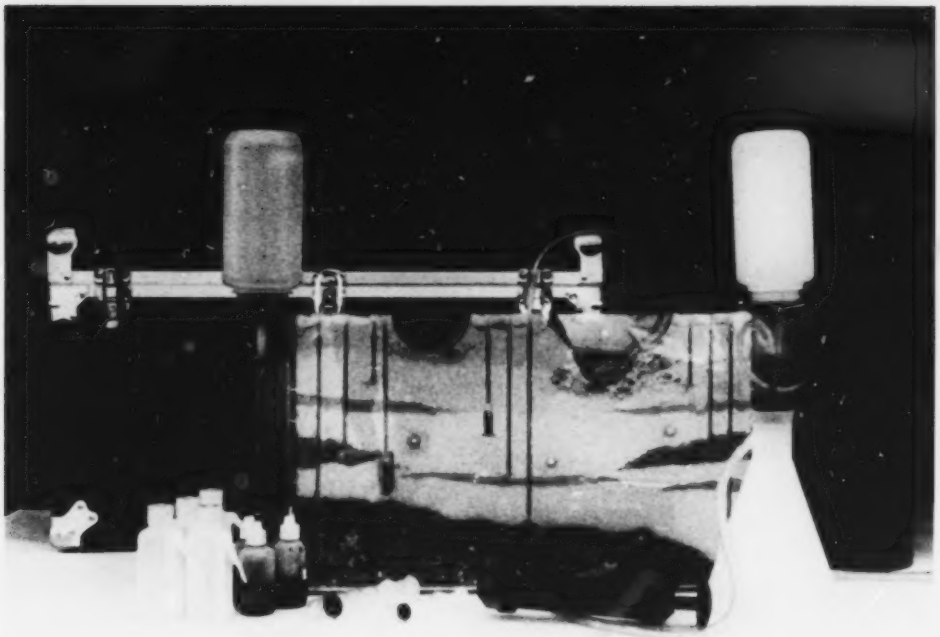
Typical Demonstration Length:

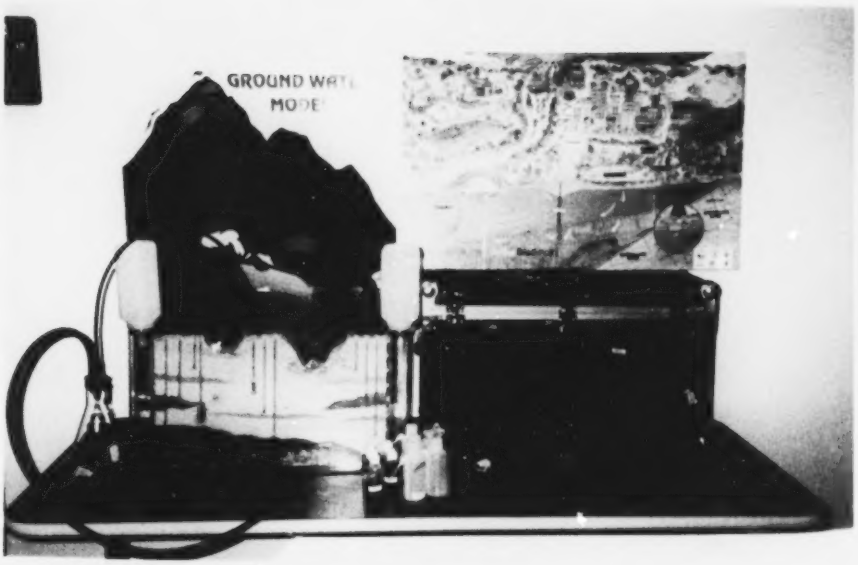
Variable in a water festival setting
20 minutes (minimum) in a classroom setting
90 minutes (maximum) depending upon background of the audience, number of questions, number of concepts illustrated, degree of participation of the audience, etc.

Age Group:

All age groups from Kindergarten through adult. Demonstration can easily be tailored to meet the background level of the audience.

Notes: Especially effective when used with the EnviroScape Model Demonstration.





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GROUNDWATER MODEL
with
NO LEAKY UNDERGROUND STORAGE TANK (Leaky UST)

Description:

The No Leaky UST Ground Water Model (GW Model) is similar to the 'Standard GW Model' in that it is a representation of a vertical 'slice' of the earth in a 'typical' continental or inland environment. It consists, from the bottom up, of a confined or artesian aquifer, a confining layer, and an unconfined aquifer. It includes a representation of a lake or river, a surface point source for contamination, and four types of wells (observation wells, pumping wells, artesian wells, and injection wells). The major difference is that it has no leaking underground storage tank (Leaky UST).

The GW Model is used to illustrate up to 27 groundwater concepts, including how it is stored in the ground, how it moves through the ground, how it gets into or leaves the ground, how water gets contaminated in the ground, several technologies for cleaning or removing the contamination from the water and aquifer materials, and some ideas about preventing contamination and water conservation.

The demonstration consists of filling the model with water, injecting food coloring at various points in the model, and then extracting the water and coloring from the model by using a hand pump connected to one of the pumping wells. By following the flow of the food coloring through the model, the audience can see how water flows through the ground, how contamination gets into the water and moves with it, and how fragile and interconnected the groundwater system really is.

The demonstration and the concepts illustrated during the demonstration are related to common, everyday events and household practices. The demonstration is interactive with the audience in that the audience does the pumping, gets to add coloring in response to questions, and answer their own questions by doing an experiment that illustrates the concept behind their question.

Typical Audience Size:

5 - 8 students/audience in a water festival setting
10 - 15 students (maximum) in a classroom setting

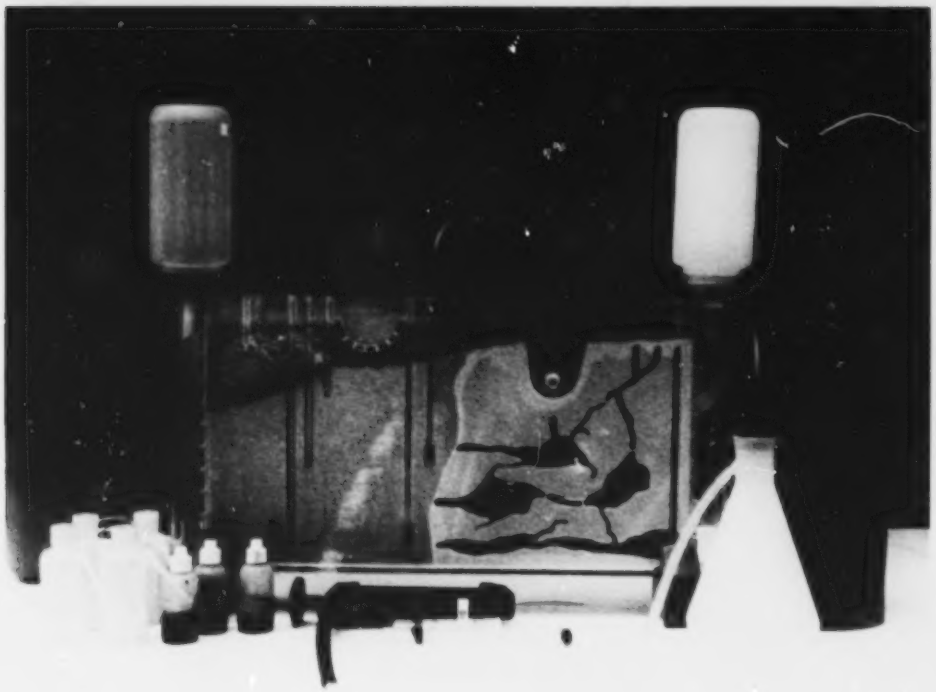
Typical Demonstration Length:

Variable in a water festival setting
20 minutes (minimum) in a classroom setting
90 minutes (maximum) depending upon background of audience, number of questions, concepts illustrated, and/or degree of participation of audience, etc.

Age Group:

All age groups from Kindergarten through adult. Demonstration can easily be tailored to meet the background level of the audience.

Note: Especially effective when used with the EnviroScape Model Demonstration.



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GROUNDWATER MODEL
KARST

Description:

The 'Karst Groundwater Model' (GW(K) Model) is a representation of a vertical 'slice' of the earth in a 'typical' mountain, coastal, or limestone area. It consists of two distinct halves, one side is a typical unconfined aquifer, and the other side, adjacent and in to contact with the unconfined aquifer, is a fractured and cavernous bedrock material. It includes a representation of three types of wells (observation wells, pumping wells, and injection wells).

The GW (K) model is used to illustrate the concepts of interaction between bedrock aquifers and unconfined (or confined) aquifers, including how it is stored in the ground, how it moves through the ground, how it gets into or leaves the ground, and how water gets contaminated in the ground. Several technologies for cleaning or removing the contamination from the water and aquifer materials, and some ideas about preventing contamination and water conservation are also shown and discussed.

The demonstration consists of filling the model with water, injecting food coloring at various points in the model, and then extracting the water and coloring from the model by using a hand pump connected to one of the pumping wells. By following the flow of the food coloring through the model, the audience can see how water flows through the ground, how contamination gets into the water and moves with it, and how fragile and interconnected the groundwater system really is.

The demonstration and the concepts illustrated during the demonstration are related to common, everyday events and household practices. The demonstration is interactive with the audience in that the audience does the pumping, gets to add coloring in response to questions, and answer their own questions by doing an experiment that illustrates the concept behind their question.

Typical Audience Size:

5 - 8 students/audience in a water festival setting
10 - 15 students (maximum) in a classroom setting

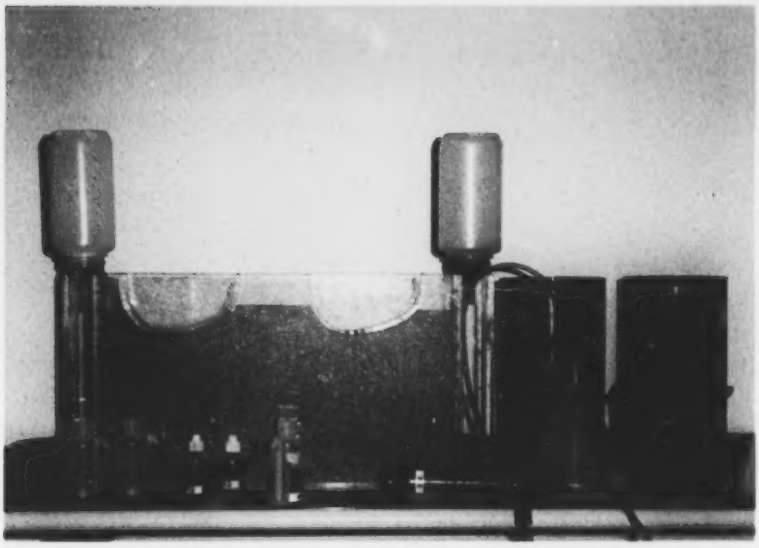
Typical Demonstration Length:

Variable in a water festival setting
20 minutes (minimum) in a classroom setting
90 minutes (maximum) depending upon background of the audience, number of questions, number of concepts illustrated, degree of participation of the audience, etc.

Age Group:

All age groups from 3rd grade through adult. Demonstration can easily be tailored to meet the background level of the audience.

Note: Especially effective when used with the EnviroScape Model Demonstration.



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GROUNDWATER
LANDFILL - STANDARD

Description:

The 'Standard Landfill Model' (LF Model) is a representation of a vertical 'slice' of the earth in an area below a 'typical' landfill setting. It consists of an unconfined aquifer and a constructed landfill.

The LF Model is used to illustrate how leaching and improperly constructed landfills pollute the soils and eventually the water table below the landfill. It is also used to discuss and investigate strategies for construction and sealing of landfills so that pollution and leaching are controlled or eliminated.

The demonstration consists of partially filling the model with water, placing dissolvable materials and food coloring in the landfill, and then sprinkling water over the landfill to illustrate leaching and pollution transport. Water can be added to or extracted from the ends of the model to raise or lower the water table. By raising and lowering the water table, the pollution is transferred from the soils to the water and then dispersed throughout the water table.

Different technologies for lining the landfill, or sealing or capping the landfill can be discussed and demonstrated.

The demonstration and the concepts illustrated during the demonstration are related to common, everyday events. The demonstration is interactive with the audience in that the audience does the pumping, gets to add coloring in response to questions, and answer their own questions by performing an experiment that illustrates the concept behind their question.

Typical Audience Size:

5 - 8 students/audience in a water festival setting
10 - 15 students (maximum) in a classroom setting

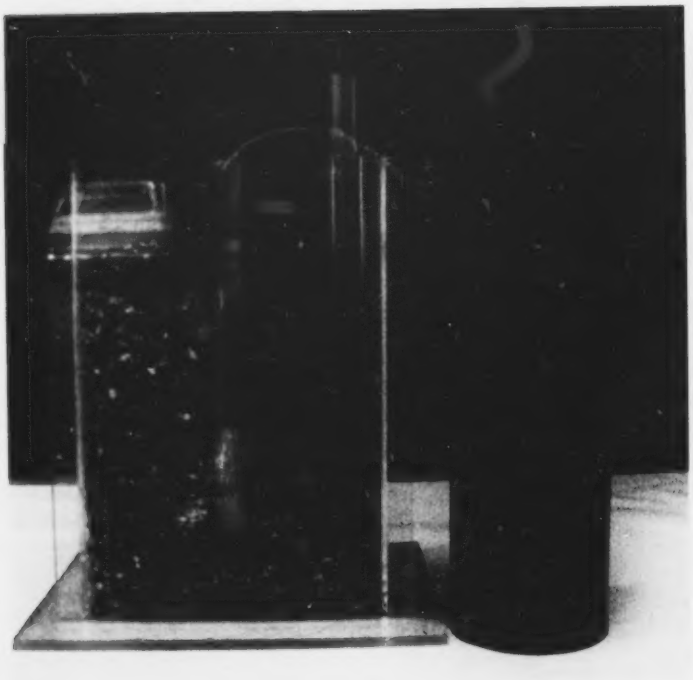
Typical Demonstration Length:

Variable in a water festival setting
20 minutes (minimum) in a classroom setting
90 minutes (maximum) depending upon background of audience, number of questions, number of concepts illustrated, degree of participation of audience, etc.

Age Group:

All age groups from Kindergarten through adult. Demonstration can easily be tailored to meet the background level of the audience.

Notes: Especially effective when used with the EnviroScape Landfill Model Demonstration.



GROUNDWATER WELL
MODEL - CUTAWAY

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GROUNDWATER WELL CUT-AWAY

Description:

The Ground Water Well Cut-Away model is a representation of a 'typical' ground water well with a screen, with or without a filter pack, and the native materials.

The model is used to illustrate how water enters a well, the cone of depression next to the well, the cavitation in the well at high capacities, and the effects of a filter pack (if used).

The demonstration consists of filling the model with water, and then using a hand pump to remove water from the well bore. The water pumped out is returned to the model through a filling tube near the edge of the model. By varying the pumping rate, various cones of depression can be generated, and cavitations can be reached.

Typical Audience Size:

5 - 8 students/audience in a water festival setting
10 - 15 students (maximum) in a classroom setting

Typical Demonstration Length:

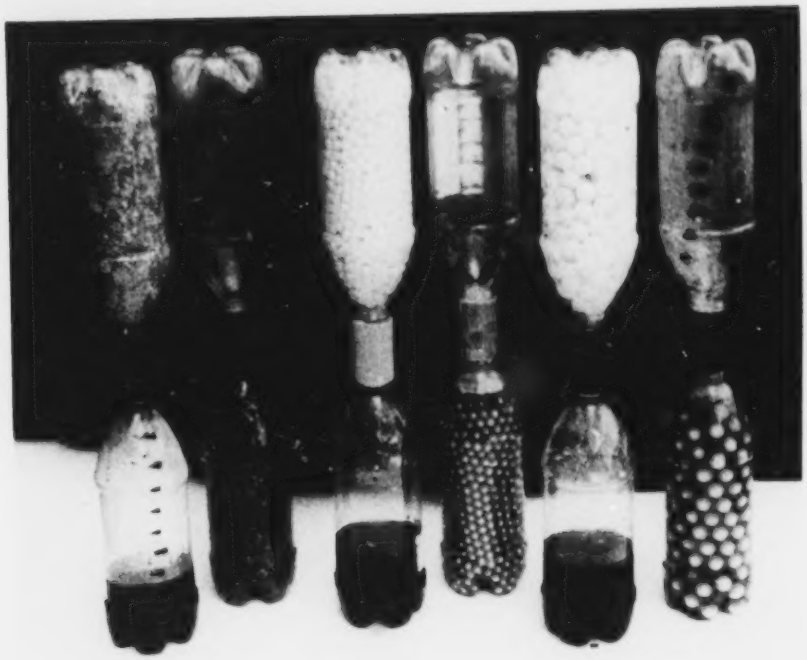
Variable in a water festival setting
20 minutes (minimum) in a classroom setting
90 minutes (maximum) depending upon background of the audience, number of questions, number of concepts illustrated, degree of participation of the audience, etc.

Age Group:

All age groups from Kindergarten through adult.
Demonstration can easily be tailored to meet the background level of the audience.

Note:

Especially effective when used with the Groundwater Model.



POROSITY TANKS

GRAVEL

SAND

SILT

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POROSITY TANKS (BOTTLES)

Description:

This presentation uses three pairs of identical plastic bottles* (joined with a screw-cap connector). Each bottle is of equal volume, filled to the same level with different materials (simulating pea-gravel, sand, and very fine sand) and colored water. These bottles are used to illustrate the material properties of porosity, field capacity, storativity, specific yield, and specific retention.

* For some presentations, three identical large plexiglass tanks filled with pea gravel, sand and very fine sand are used (though these are heavy and cumbersome to transport). Each tank is of equal volume, filled to the same level with different materials (pea-gravel, sand, and very fine sand) and water. These tanks are used to illustrate the material properties of porosity, permeability, field capacity, storativity, specific yield, and specific retention. Each tank has a drain built into the bottom to release the water.

Typical Audience Size:

10 - 15 students/viewers in a water festival setting
15 - 20 students in a classroom setting

Typical Demonstration Length:

Varies in a water festival setting
20 minutes (minimum) in a classroom setting
30 minutes (ideal)
45 minutes (maximum) depending upon the number of questions, interest level of the audience, etc.

Age Group:

All age groups from Kindergarten through adult. The ideal age group is third through eighth grade.

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ENVIROSCAPE with GROUNDWATER ADD-ON

Description:

The Groundwater add-on to the Standard EnviroScape Model consists of a plastic base liner with foam and marbles to represent aquifers, unsaturated zones, and bedrock. Removable plugs in the landscapes are used to move water from the landscapes into the groundwater liner.

The demonstration consists of sprinkling cocoa and powdered drink mix on the landscape and then simulating precipitation events with a spray bottle. The audience sees the results of the dissolution and transport of the 'contaminants', and their eventually making it to the surface water streams and reservoir. From there the demonstration illustrates how the contaminated surface waters soak into the ground and reach the groundwater table. Spray pumps can be inserted into the ground water liner through the holes in the landscape to illustrate ground water pumping.

The EnviroScape model illustrates how everyday human actions have the potential to contaminate surface and groundwater supplies, how we can change our actions to protect the water supplies, to conserve water, and how to return the existing waters to near pristine conditions.

Typical Audience Size:

5 - 10 students/viewers in a water festival setting
10 - 15 students in a classroom setting

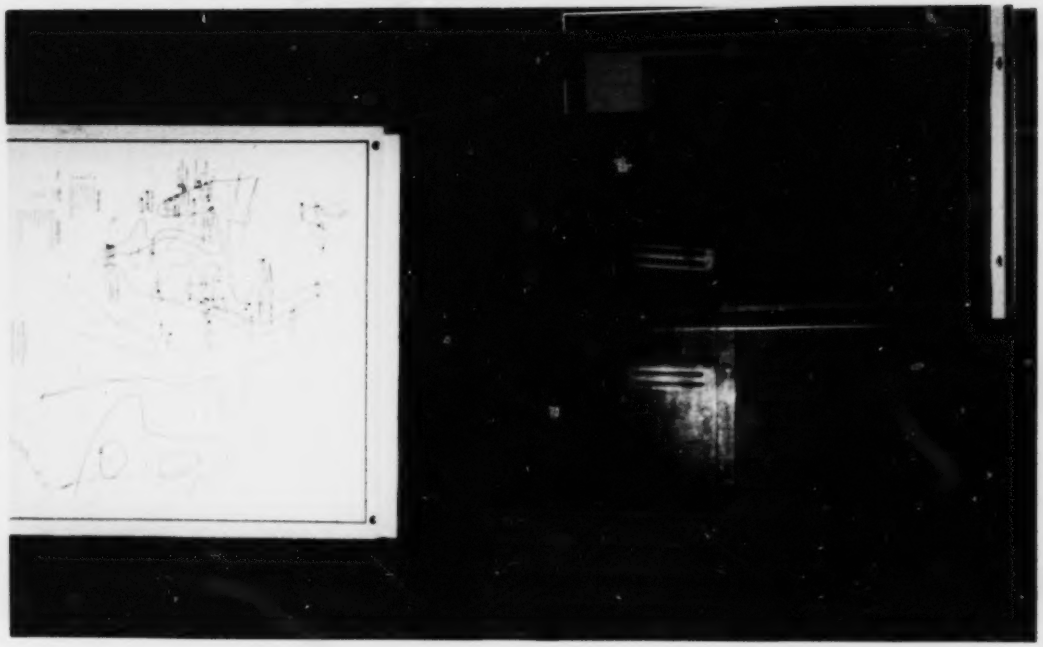
Typical Demonstration Length:

Varies in a water festival setting
20 minutes (minimum) in a classroom setting
35 minutes (ideal)
50 minutes (maximum) depending upon the number of questions, interest level of the audience, etc.

Age Group:

All age groups from Kindergarten to adult.
Demonstration can be easily tailored to meet the background level of the audience.

Note: Particularly effective when used with the Groundwater Model.



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EARTHQUAKE TANK

Description:

The Earthquake Tank is an interactive demonstration of liquefaction and ground movements during earthquake events. The demonstration consists of a large plexiglass tank filled with sand. The sand is saturated with water and models of buildings, underground storage tanks, trees, etc., are placed in and on the sand. The entire tank is then mildly vibrated sending shock waves through the sand. The vibration is then accelerated resulting in the underground storage tank floating to the surface, the buildings falling over, trees shifting, etc.

The concept of liquefaction, where and how it occurs, is shown with this model. Additionally, this demonstration can illustrate both S and P waves.

Typical Audience Size:

Not appropriate for a water festival setting
15 - 25 in a classroom setting

Typical Demonstration Length:

40 minutes (minimum) in a classroom setting
75 minutes (maximum) depending upon background of the audience, number of questions, number of options discussed, degree of participation of students etc.

Age Group:

All age groups from third grade through adult.

Note:
The current version is large and is not suitable for transport to schools or water festivals. A more portable version is being developed and should be available for transport to off-site events, until then this will only be shown on the Denver Federal Center.

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EDIBLE GEOLOGY

Description:

The Geology Cake is an edible demonstration of faults and folding. The cake is a multi-layer cake decorated to resemble the surface of the earth. The layers represent the different layers of rock (i.e., marble cake, swirl cake, jelly interlayer, etc.) The cake is assembled on several cardboard or cake tray sheets. When the sheets are pulled apart, or slid parallel to each other, the cake splits in various ways that illustrate various types of faults (slip faults, normal faults, transverse faults.) The fault characteristics can be seen in the offset of the cake layers.

Folds are illustrated using alternating layers of Jell-O and pudding in class bread pans. The Jell-O and pudding are squeezed together from the ends (or from one end) and the behavior of the materials is observed. The Jell-O cracks and splits while the pudding flows - representing different types of rocks (shales, quartzite, etc.)

Silly Putty is also used to illustrate the response of earth materials to different types of stresses (snaps under rapid stress and stretches under prolonged stress).

Maps and photos are used to show real world examples of what is seen in the cake and Jell-o/pudding demonstrations.

Typical Audience Size:

Not appropriate for a water festival setting
15 - 25 in a classroom setting

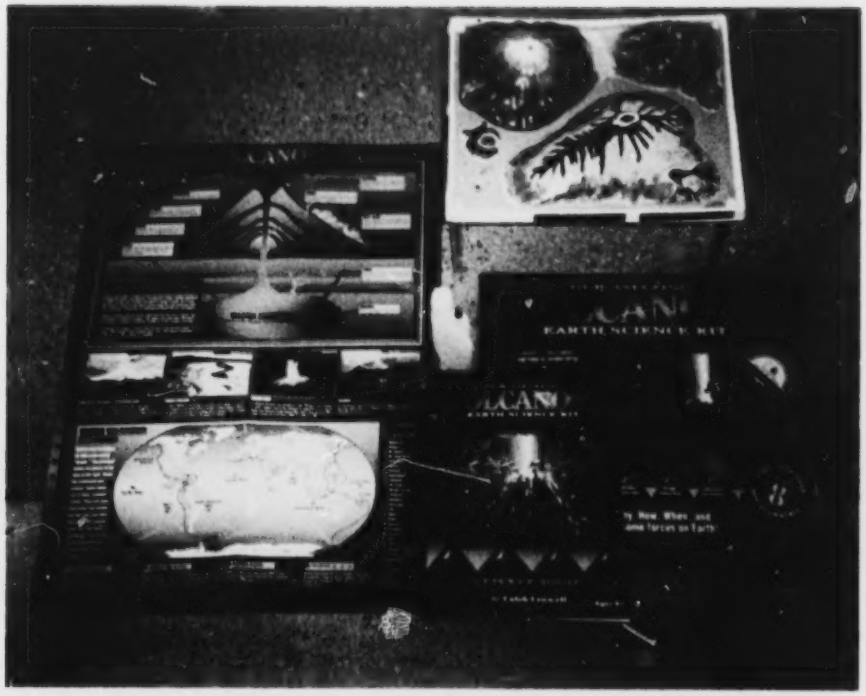
Typical Demonstration Length:

40 minutes (minimum) in a classroom setting
75 minutes (maximum) depending upon background of the audience, number of questions, number of options discussed, degree of participation of the students, etc.

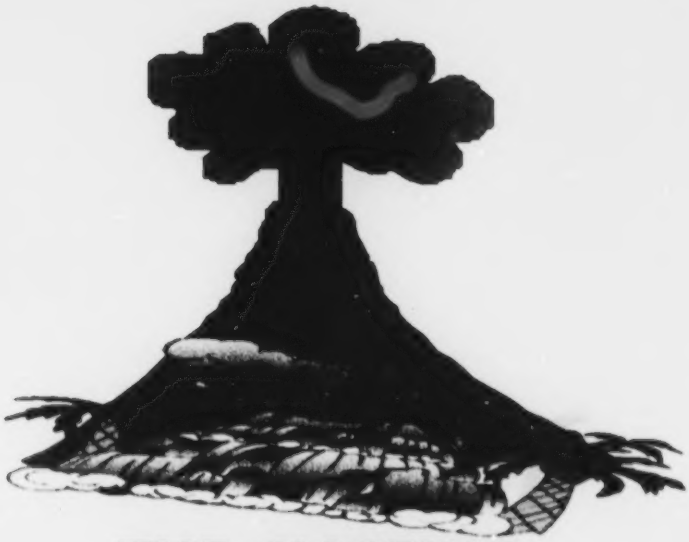
Age Group:

All age groups from third grade through adult.

Note: After the presentation, the students can eat the evidence.



GEOLOGY



THE AMAZING VOLCANO

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VOLCANO MODEL

Description:

This presentation consists of a small 'landscape' that shows seven different volcanos representing the major types of volcanic eruptions and magma types. The model uses common baking soda and vinegar to create 'eruptions' from each volcano. The 'eruptions' can be modified by changing the concentration of the vinegar to represent very fluid magmas, pyroclastic magmas, andesitic magmas, cinder cones, etc. The addition of food coloring to the vinegar solution creates colored magmas. Eruptions can be from 6 inches to more than 6 feet high, depending upon the strength of the vinegar solution and the speed at which it mixes with the baking soda.

The model also contains a poster illustrating the processes involved in volcanic eruptions, along with a map showing the belts of a volcano around the world and how they relate to tectonic forces.

Typical Audience Size:

5 - 8 students/viewers in a water festival setting
10 - 12 students in a classroom setting

Typical Demonstration Length:

Varies in a water festival setting
20 minutes (minimum) in a classroom setting
35 minutes (ideal)
60 minutes (maximum) depending upon the number of questions, interests level of the audience, etc.

Age Group:

An ideal age group is third through eighth grade.

Notes: Combines well with the Edible Geology and Earthquake demonstrations. The demonstrating can be 'messy' and is recommended for use in a lab room or outside.

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ENVIROSCAPE
STANDARD

Description:

The 'standard' EnviroScape Model demonstration consists of a plastic landscape base that represents a variety of human and natural activities or actions that affect and/or impact the quality of surface water. These include a residential area, construction area, factory, farm and ranch area, wastewater treatment plant, golf course, streams, reservoir, streets, and natural areas.

The demonstration consists of sprinkling water soluble colored powders on the landscape and then simulating precipitation events with a spray bottle. The audience sees the results of the dissolution and transport of the 'contaminants', and their eventually making it to the surface water streams and reservoir. From there the demonstration illustrates how the contaminated surface waters soak into the ground and reach the groundwater table.

The EnviroScape model illustrates how everyday human actions have the potential to contaminate surface and groundwater supplies, how we can change our actions to protect the water supplies, to conserve water, and how to return the existing waters to near pristine conditions.

Typical Audience Size:

5 - 10 students/viewers in a water festival setting
10 - 15 students in a classroom setting

Typical Demonstration Length:

Varies in a water festival setting
20 minutes (minimum) in a classroom setting
35 minutes (ideal)
50 minutes (maximum) depending upon the number of questions, interest levels of the audience, etc.

Age Group:

All age groups from Kindergarten to adult.
Demonstration can be easily tailored to meet the background level of the audience.

Note: Particularly effective when used with the Groundwater Model.

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ENVIROSCAPE
HAZARDOUS WASTE

Description:

The 'hazardous waste' EnviroScape Model demonstration consists of a plastic landscape base that represents specific human activities or actions dealing with hazardous materials and practices that affect and/or impact the quality of surface water. These include a residential area, construction area, a factory, a gas station, a landfill area, a wastewater treatment plant, streams, reservoir, streets, railroad lines, and natural areas.

The demonstration consists of sprinkling water soluble colored powders on the landscape and then simulating precipitation events with a spray bottle. The audience sees the results of the dissolution and transport of the 'contaminants', and their eventually making it to the surface water streams and reservoir. From there the demonstration illustrates how the contaminated surface waters soak into the ground and reach the groundwater table. Through the use of toy vehicles designed to spill hazardous materials when tipped over (i.e., a tanker truck and a railroad tanker car), the audience can see the potential for major spills and environmental impacts from common, everyday events.

The EnviroScape model illustrates how everyday human actions have the potential to contaminate surface and groundwater supplies, how we can change our actions to protect the water supplies, to conserve water, and how to safely handle, transport, and store hazardous materials to protect the health and safety of humans and the environment.

Typical Audience Size:

5 - 10 students/viewers in a water festival setting
10 - 15 students in a classroom setting

Typical Demonstration Length:

Varies in a water festival setting
20 minutes (minimum) in a classroom setting
35 minutes (ideal)
50 minutes (maximum) depending upon the number of questions, interest levels of the audience, etc.

Age Group:

All age groups from Kindergarten to adult.
Demonstration can be easily tailored to meet the background level of the audience.

Note: Particularly effective when used with the Groundwater Model.

ENVIROSCAPE

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LANDFILL MODEL

ENVIROSCAPE
LANDFILL

The EnviroScape Landfill model is a functional, portable model that shows how today's modern landfill systems protect our groundwater and differs from the "dumps" of the past. The model and activities show:

- leachate accumulation, collection and management in a landfill cell
- liner failure and use of back up protective systems
- leachate recirculation and transfer for off-site treatment
- closure of a completed landfill cell with capping system; and
- comparison of a modern landfill cell to an old-style "dump"

The model allows users to pump water into the landfill trays, and observe how it turns dirty as it leaches through the sponges that represent trash. The same water pumped into an unlined dump will leak into the aquifer. Trays represent landfill liners, backup liners, leachate collection systems and landfill cells. Model-size leachate tanks, an unlined dump and buildings contribute to the topography.

Through active demonstration users/observers of all ages experience the cause and effect of specific actions, reinforcing important environmental management concepts.

It also tells the idea that there is a serious technology in landfills. When we pay our garbage collection fees, we are not just paying for someone to pick up the trash, we are paying for someone to responsibly landfill our garbage.

Typical Audience Size:

5-10 students/viewers in a water festival setting
10-15 students in a classroom setting

Typical Demonstration Length:

Varies in water festival setting
20 minutes (minimum) in a classroom setting
35 minutes (ideal)
50 minutes (maximum) depending upon the number of questions, interest levels of the audience, etc.

Age Group:

All age groups from Kindergarten to adult.
Demonstration can be easily tailored to meet the background level of the audience.

Note: Particularly effective when used with the Groundwater Model.

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ENVIROSCAPE with RIPARIAN ADD-ON

Description:

The Riparian Add-on consists of felt pads, sponge pieces, extra water bottles and sprayers, Q-tips, clay, etc. All these are used to 'build' riparian zones along the streams and around the reservoir. These are used to illustrate the importance of vegetation in moving water, withdrawing water from the ground water aquifers, modifying surface flows and qualities.

The demonstration consists of sprinkling water soluble colored powders on the landscape and then simulating precipitation events with a spray bottle. The audience sees the results of the dissolution and transport of the 'contaminants', and their eventually making it to the surface water streams and reservoir. From there the demonstration illustrates how the contaminated surface waters soak into the ground and reach the groundwater table. Spray pumps can be inserted into the ground water liner through the holes in the landscape to illustrate ground water pumping.

The EnviroScape model illustrates how every day human actions have the potential to contaminate surface and groundwater supplies, how we can change our actions to protect the water supplies, to conserve water, and how to return the existing waters to near pristine conditions.

Typical Audience Size:

5 - 10 students/viewers in a water festival setting
10 - 15 students in a classroom setting

Typical Demonstration Length:

varies in a water festival setting
20 minutes (minimum) in a classroom setting
35 minutes (ideal)
50 minutes (maximum) depending upon the number of questions, interest levels of the audience, etc.

Age Group:

All age groups from Kindergarten to adult.
Demonstration can be easily tailored to meet the background level of the audience.

Note: Particularly effective when used with the Groundwater Model.

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ENVIROSCAPE
WETLANDS

Description:

The 'Wetlands' EnviroScape Model demonstration consists of a plastic landscape base that represents specific human activities or actions that can affect natural wetlands. It also shows how both natural and man-made wetlands can be used to modify the impacts of man's actions and practices that affect and/or impact the quality of surface water. These include a residential area, construction area, a factory, a marina, a shopping area, a farm and ranch area, streams, a reservoir, streets, and natural areas.

The demonstration consists of sprinkling water soluble colored powders mix on the landscape and then simulating precipitation events with a spray bottle. The audience sees the results of the dissolution and transport of the 'contaminants', and their eventually making it to the surface water streams and reservoir. From there the demonstration illustrates how the contaminated surface waters soak into the ground and reach the groundwater table. Self-adhesive felt pads are used to represent wetlands. Through the use of the felt pads, the audience can see the effects of wetlands, and can compare the contamination of surface waters both with and without the influences of wetlands.

The EnviroScape model illustrates how many every day human actions have the potential to contaminate surface and groundwater supplies. It also shows how we can change our actions to protect the water supplies, to conserve water, and how to protect natural wetlands and to construct artificial wetlands that will help modify the results of human actions and help protect the health and safety of humans and the environment.

Typical Audience Size:

5 - 10 students/viewers in a water festival setting
10 - 15 students in a classroom setting

Typical Demonstration Length:

Varies in a water festival setting
20 minutes (minimum) in a classroom setting
35 minutes (ideal)
50 minutes (maximum) depending upon the number of questions, interest levels of the audience, etc.

Age Group:

All age groups from Kindergarten to adult.
Demonstration can be easily tailored to meet the background level of the audience.

Note:

Particularly effective when used with the Groundwater Model.

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WETLAND-IN-A-BOTTLE

Description:

The Wetland-in-a-Bottle is an interactive learning activity where students design and then build a wetland using a 1-gallon bottle, natural materials (gravel, sand, humus, and moss), and live plants.

Usually, the students work as a group to design and build the first wetland. They are then given instruction sheets for designing and building their own wetland either at home or for their classroom. The Wetland-in-a-Bottle project is adaptable to just about any size container, from 1-gallon bottles to large aquarium tanks of 50-gallons or more. It can be enhanced with the addition of appropriate small animals and/or insects - which are described on the instruction sheet along with appropriate plant species.

Typical Audience Size:

10 - 15 students in a water festival setting or classroom setting
5 students (maximum) per bottle if assembling individual wetlands

Typical Demonstration Length:

30 minutes (minimum) in a classroom setting
45 minutes (maximum) depending upon background of the audience, number of questions, number of options discussed, degree of participation, etc.

Age Group:

All age groups from 3rd grade through adult.

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WETLANDS-IN-A-PAN

Description:

The Wetlands-in-a-Pan is an interactive 'game' where students design wetlands and then experiment with the wetlands to learn the basic processes of wetlands, and their fragile nature. The wetlands are constructed in a painter's pan using sand and indoor-outdoor carpet. Rain events are represented using a 1-liter soda bottle with a sprinkler spout or a simple tube attached to it.

Typical Audience Size:

In a water festival setting or classroom - one student is chosen or the instructor can show the procedure. Others can observe and discuss results.

In small groups/classrooms this can be done with 3-4 pairs of students (6-8 students total, at once) - (limited to number of pans and materials available). The two students each have a pan. Student #1 uses his pan to show land without a wetland. Student #2 uses the other pan to show results with a wetland.

Typical Demonstration Length:

30 minutes (minimum) in a classroom setting
45 minutes (maximum) depending upon background of the audience, number of questions, number of options discussed, degree of participation of students, etc.

Age Group:

All age groups from third grade through adult.

Note: This is usually a very "wet" project, placing sand and water in the pans, and during the cleanup. It is best done outdoors, or with a large plastic tarp. This is both an educational and a fun activity to participate in.

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INSTANT SNOWSTORM

Description:

The "instant snowstorm" demonstration is exceedingly popular, appealing to students from about 3rd grade and up, and even more so for adults. It shows many cloud physics principles by actually making a cloud and snow crystals right in front of the viewers' eyes.

A small chest freezer is brought into the darkened classroom or demonstration area. A light beam shines into the freezer to make cloud droplets and tiny snow crystals visible against a black velvet background. Sometimes a video camera is used to enlarge the scene on a TV set viewed by class sizes greater than a dozen.

The scientist first explains what is going to be seen in the freezer because some things happen quickly. A cloud is blown into the freezer from one's breath. It becomes "supercooled." The cloud is then "seeded" to generate 100 million snow crystals. Rather than use the cloud seeding chemicals of dry ice or silver iodide, popping a bubble of small bubble-wrap simply does the crystal generation. That lets the viewers go home and show their friends and parents, if they have a chest freezer there. The crystals are then "fed" with more breath and can be seen to grow in size until they are big enough to fall to the bottom of the freezer.

Between successive "snowstorms" the scientist tells how snow crystals get their many shapes (mostly temperature and some moisture dependencies). At the end the scientist tells how similar cloud seeding techniques can be used to gather more clean water from clouds for use in snowpacks (recreation, water storage), meltwater (irrigation, hydroelectric power, drinking and industrial water), and extra rainfall if temperatures are warm enough at the surface.

For typical class sizes the "snowstorms" are generated three times. For each event about ten people can gather around the freezer and see the snow close up while the others watch on the TV. When the students are junior high age or older, and more time is available, the students are often guided to make the cloud and make it convert to snow themselves, adding to their memories of the event.

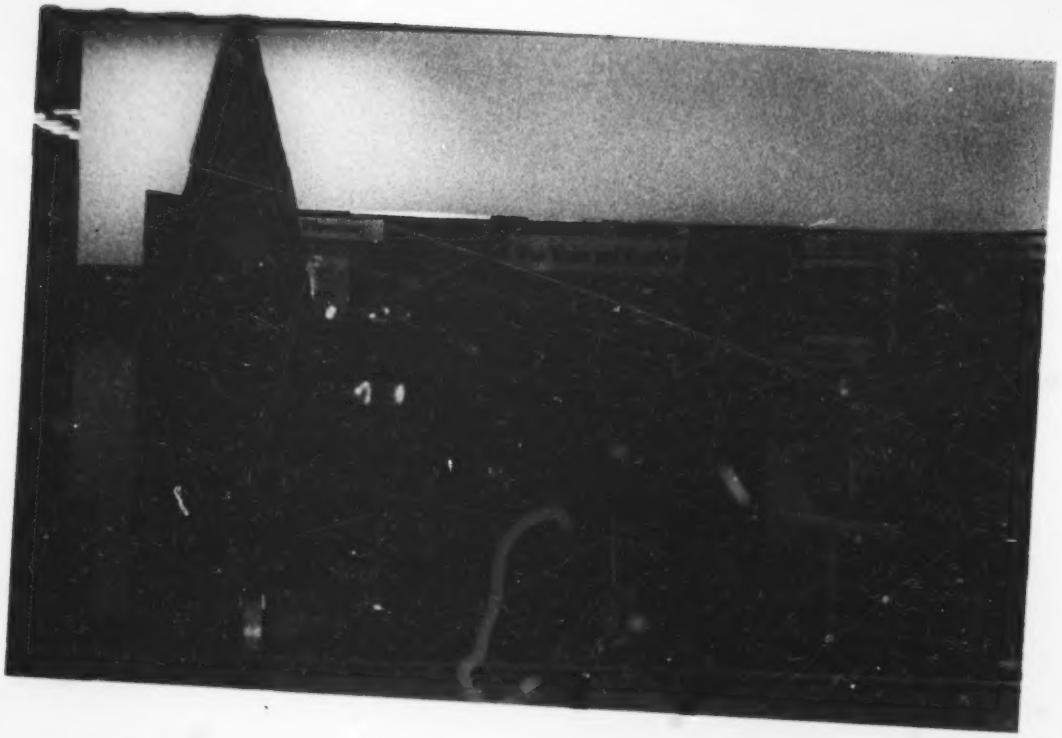
Typical Audience Size:

10 - 15 students/viewers in a water festival setting
20 - 30 students in a classroom setting

Typical Demonstration Length:

20 minutes; this can be lengthened to about 50 minutes in a classroom with the addition of microscopic examination of preserved snow crystals and photographic slides.

Age Group: 3rd grade through adult



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WEATHER
PRESENTATION/DEMONSTRATION

Description:

This presentation covers the stormy relationship between water and weather. Students are introduced to the hydrologic cycle and how precipitation occurs and the concepts surrounding severe thunderstorms, including flooding, lightning, and tornadoes. Safety and disaster preparation skills are discussed and reviewed. Actual instruments used in weather observations are displayed and explained.

There are two short videos that can also be shown, depending on the time allowed. One is on flooding, and the other on severe storms and tornadoes. Either video will enhance this interactive learning demonstration or the teacher's lesson plan in the classroom.

Typical Audience Size:

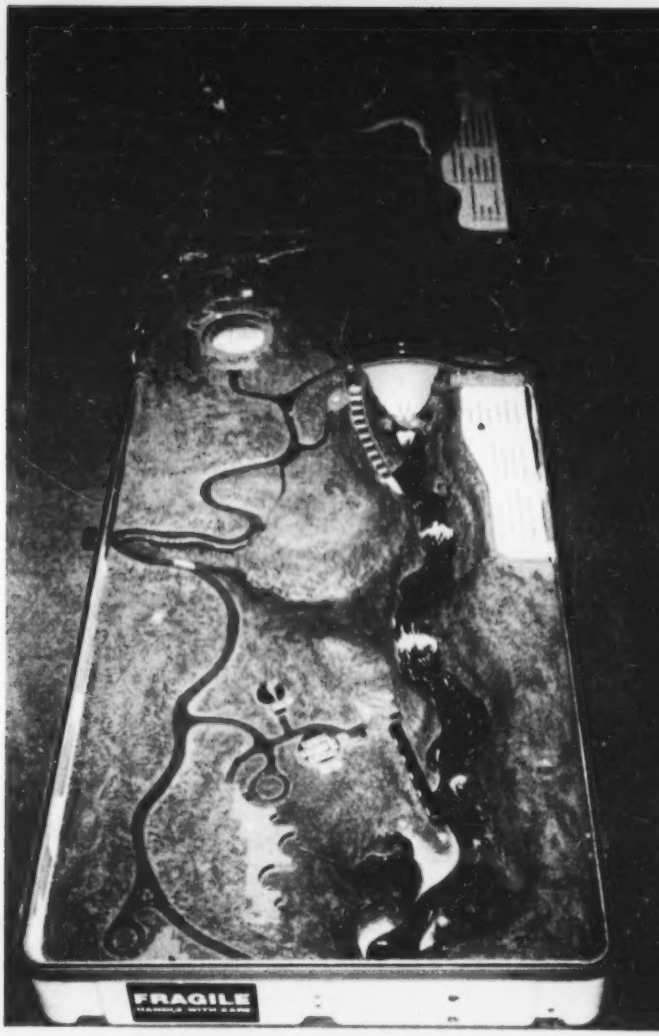
10 - 15 students/viewers in a water festival setting
15 - 20 students in a classroom setting

Typical Demonstration Length:

Varies in a water festival setting
20 minutes (minimum) in a classroom setting
35 minutes (ideal)(w/videos)
60 minutes (maximum) depending upon the number of questions, interest levels of the audience, etc.

Age Group:

An ideal age group is third through eighth grade.



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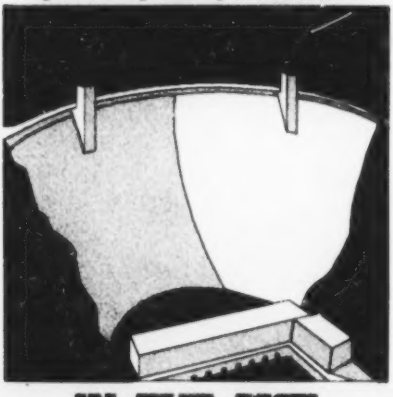
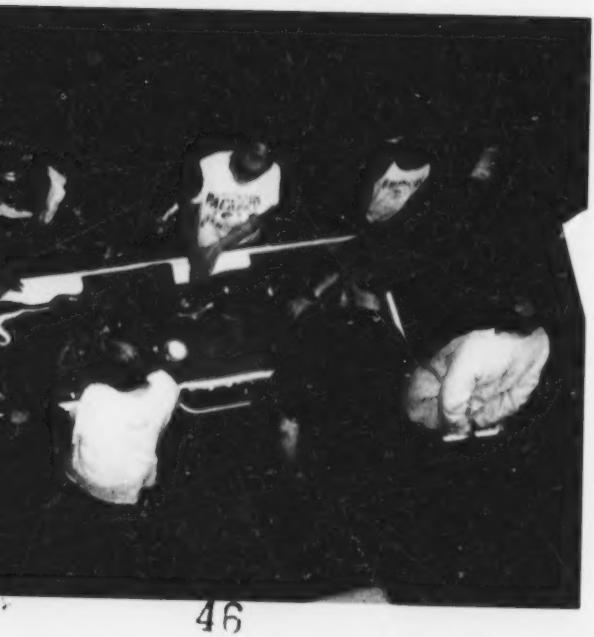
RECLAMATION



IN THE 21ST CENTURY



21ST CENTURY
WORKING RESERVOIR MODEL

Starting from a high mountain lake, water flows down into a working model reservoir complete with a power generation plant, fish ladder, and fish screen. Along the shores of the reservoir are adjacent irrigated agricultural lands, wetlands, a nature trail, and recreation area with boat ramp and campground. Follow the flow of the tail waters downstream to a state of the art Archimedes screws quietly lifting the water from the river to a modern municipal water treatment plant. Observe the adjacent environmentally designed visitors' center, the administrative site and environmental education center.

An excellent demonstration for the multiple uses of water. This model is suitable for all ages, stimulating questions and discussion of the function of Reclamation in water management.

Typical Audience Size:

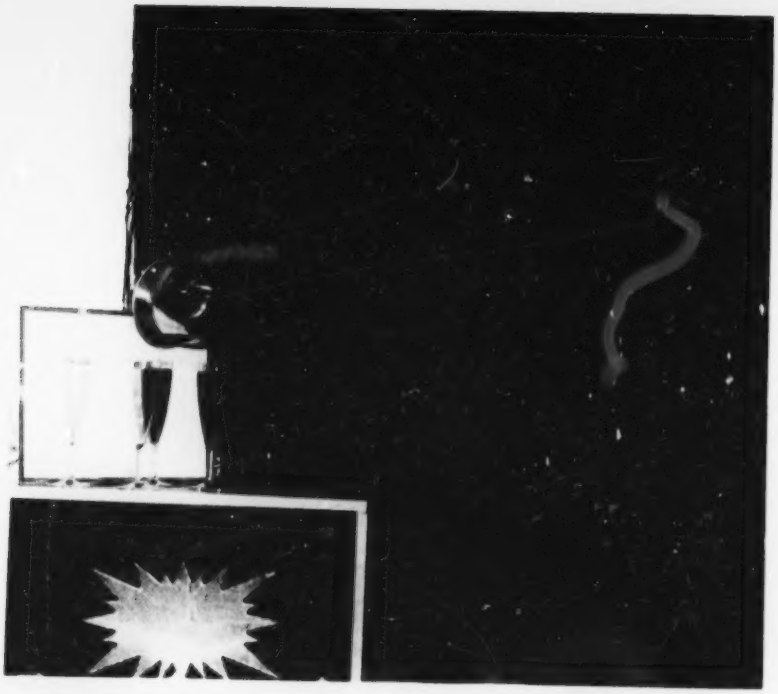
10-12 students (maximum) in a classroom setting (Allows for clear visibility of the model from the 3 major sides).

Typical Demonstration Length:

20 minutes

Age Group:

Kindergarten through adult. Demonstration can easily be tailored to meet the background level of the audience.



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WATER WITCH

Description:

This "magic show" is presented by one of our hydraulic engineers. Her expertise in actual magic (water changing colors and disappearing acts) is used to illustrate and teach students about water related uses and concepts.

The concepts presented include:

WATER USE - instream uses of water for recreation, hydropower, nature, and navigation; offstream uses for agriculture, domestic use, industry and thermoelectric;

RECYCLING AND REUSE - water is recycled and "re-used" often as it travels from the source to the oceans or atmosphere;

NATURE'S NEEDS - water is necessary to maintain life on the planet, from the plants to the animals;

TRANSPORTATION AND STORAGE SYSTEM - water storage facilities, transportation facilities, distribution systems, etc.

WATER CONSERVATION - water needs to be conserved to avoid waste and destruction of the natural resources.

Typical Audience Size:

General classroom size is no problem.

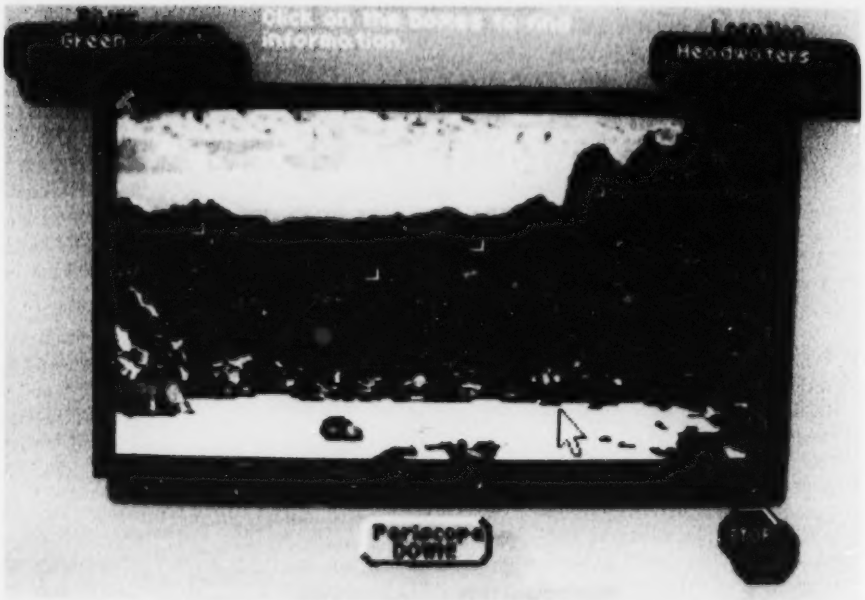
Typical Demonstration Length:

20 - 30 minutes (maximum) depending on number of questions, interest level of the audience etc.

Age Group:

Kindergarten through 6th grade is ideal.
Demonstration can be tailored to meet the background level of the audience.

Notes: The ideal situation/place for this "show" is indoors, due to the many items used. Water should be easily accessible.



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HYDROEXPLORER:
The Colorado River Run!

Description:

HYDROEXPLORER is an interactive computerized game designed by the Water Education Foundation and funded in a cooperative agreement with the United States Department of the Interior, Bureau of Reclamation, Lower Colorado Region, Water Conservation Center.

HYDROEXPLORER teaches students the story of the Colorado River - the most utilized river in the West! Students learn the many uses of the West's most valuable resource. Using slides of actual locations on the river, students learn about the geography, geology, history, anthropology and ecology of this area of seven western states, and the competition for the limited amount of water. Game players gather their research from the text, which can be viewed on-screen by clicking on boxes visible on the slides.

Game players move through the game on-screen in a mini-sub, the HYDRO-EXPLORER. At each stop, the mini-sub receives a message from Mission Control asking the students to do research on a question. The students can use the sub's periscope to view the location and retrieve information to answer the question. A correct answer earns the students three chances to run the rapids in the mini-sub. There is a set of four questions for each stop selected by Mission Control in random order, so each time students play the game, they receive a different series of questions. Sometimes Mission Control asks the players to solve a problem by exploring an area nearby, but off the river. This is called a **Walkabout**, and the questions come in series of four. If questions are answered incorrectly, the periscope can be used to explore the area and collect the data. Each correct answer exposes a picture on a billboard beside the river. If the student solves the problem, they will see **the Big Picture**. The game allows the students to pick from four different starting points (tributaries to the Colorado River).

The game also includes instructions for an interactive board style game illustrating water uses along the Colorado River - where the 'board' is a map of the Colorado River Basin.

Typical Audience Size:

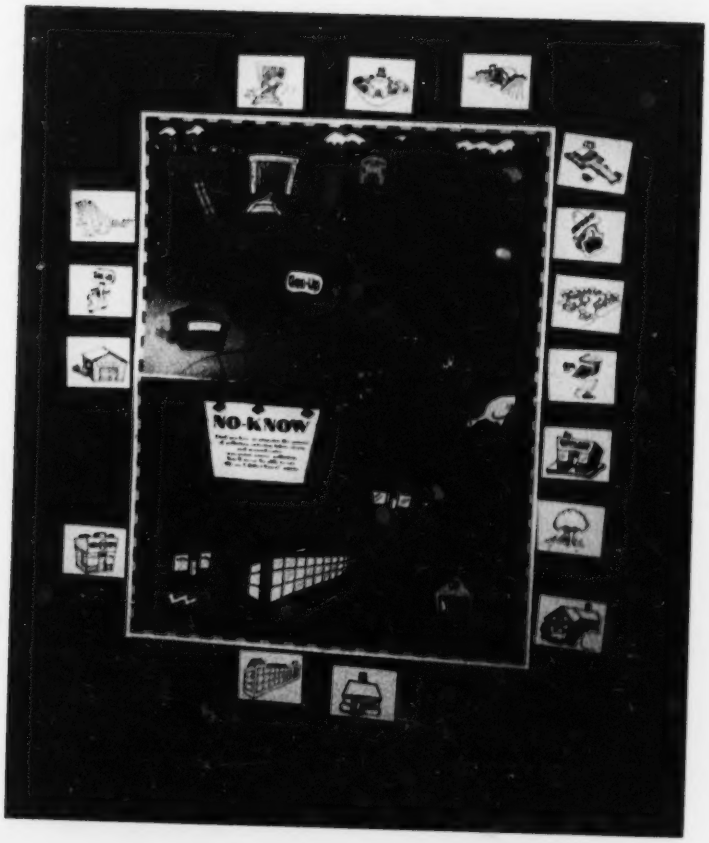
Generally only one person can use the mouse and keyboard at a time, but the game can be played by teams competing for the most correct answers.

Typical Demonstration Length:

It generally can take about 35 - 45 minutes to make one run down river, and students can easily spend up to 2 hours or more exploring all the different tributaries.

Age Group:

Designed for secondary students, but it is informative and fun for all age groups, with adults helping the younger children.



WATER GAMES

NO-KNOW

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No-KNOW

Description:

Non-point source means it is difficult to trace the actual source. Most people recognize a pipe from a factory spewing contaminants into a river as a form of pollution, but most of the water pollution in America comes from what is called "non-point" sources.

No-Know is a board game designed around point and non-point pollution sources along a river. The object of the game is to travel down the Dirty Old River from the Headwaters Mountains to Your house (the end) and learn how many sources there are for non-point pollutants.

There are four 'tokens' used to move along the river (similar to Monopoly, Shoots 'n Ladders, Life, or any number of other board games). Each player takes turns rolling a die to see if they get to move 1, 2, 3, 4, 5, or 6 spaces ahead. If the player lands on certain squares, they pick a card from such places as: " Your Yard," "Messy Mountain Mine," "Rita's Rio Riviera Restaurant," "Dirtless Dry Cleaners," etc., and reads the card to move forward, or backwards. Some messages on the cards read: [Your Yard] - "Henrietta stores chemicals carefully in labeled, air tight containers and soaks up any spills with sawdust and kitty litter. Put-'er-there, Partner!, {you can move ahead one space without rolling the die again}" or from the [Messy Mountain Mine] - "A heavy rain has filled the old mine shafts, allowing the water to interact with the metals in the rock, producing a very acidic runoff. This lowers the pH of the river to the point where the salmon eggs downstream die. That's a No-Know! Go back 2 squares."

The first one to get to the finish wins.

Typical Audience Size:

This game is meant for four players, although the 'players' could consist of a team of students.

Typical Demonstration Length:

The game generally takes between 20 and 30 minutes to complete.

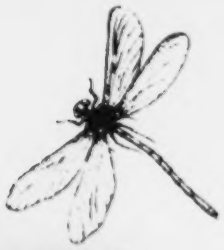
Age Group:

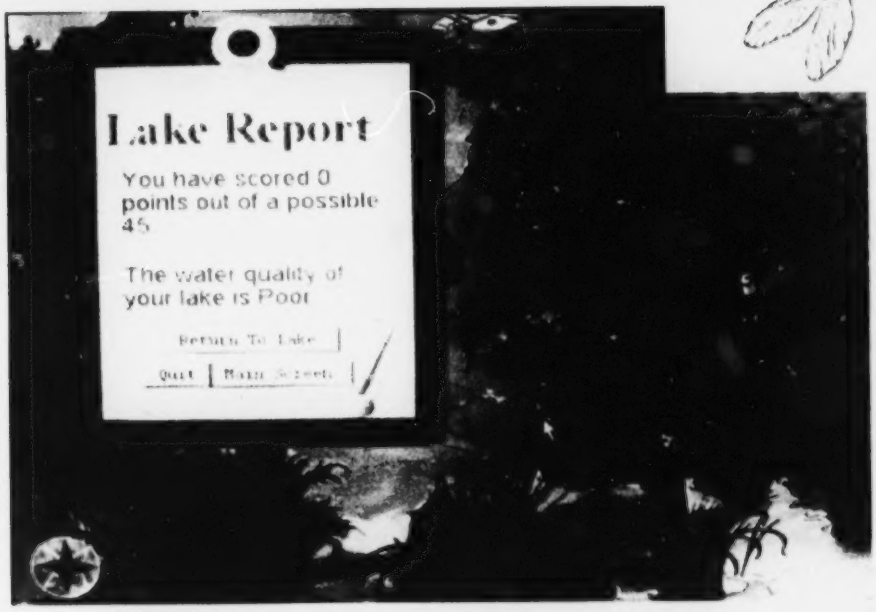
Suitable for 3 - 4 grade, but can be fun with teams made up of a family with adults to help the younger children read the cards.

Credits: Copyright through Water Education Foundation, 717 K Street, Suite 517, Sacramento, CA 95814 (916)444-6240.

WATER GAMES

SPLASH!




Lake Report
You have scored 0 points out of a possible 45
The water quality of your lake is Poor
Return To Lake
Quit
Main Screen

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SPLASH!

Description:

SPLASH! is an interactive computer game where students make on-screen selections regarding runoff and pollution control, and then see the effects of their selections on the water quality of a lake.

The game is laid out as a watershed with four settings: - an urban setting (City), a rural setting (Farm), a suburban setting (Neighborhood), and a lake.

The student begins with selecting a setting. The screen displays a 'typical' view of the setting, and the student uses the mouse to highlight different areas or activities. Clicking on the activity or area, on-screen questions appear for the student to answer. Once the student has answered all the questions, or as many as he or she wants to, then the program causes it to rain over the setting, and the effects of the student's answers are shown. After the rain, the screen setting is shifted to the lake setting, where the results of the rain affect the water quality of the lake. The student can review their 'water quality score' and then go back to any of the other settings and make additional changes by answering more questions.

The goal of the game is to get the highest lake 'water quality score' possible. Throughout the game, sound effects are used at appropriate times, and tips, explanations, and directions are given vocally by the computer to augment the on-screen displays.

System Requirements:

Mac: 68040 or Power PC, System 7.5+, CD-ROM, hard drive, 16 MB RAM

Windows: Pentium, Windows 95, CD-ROM, hard drive, 16 MB RAM (MMX Technology is recommended).

Typical Audience Size:

4-5 students at a time. Only one student at the keyboard at a time. Students could be grouped into teams, with the teams competing for the highest score, or students could compete individually for the highest score.

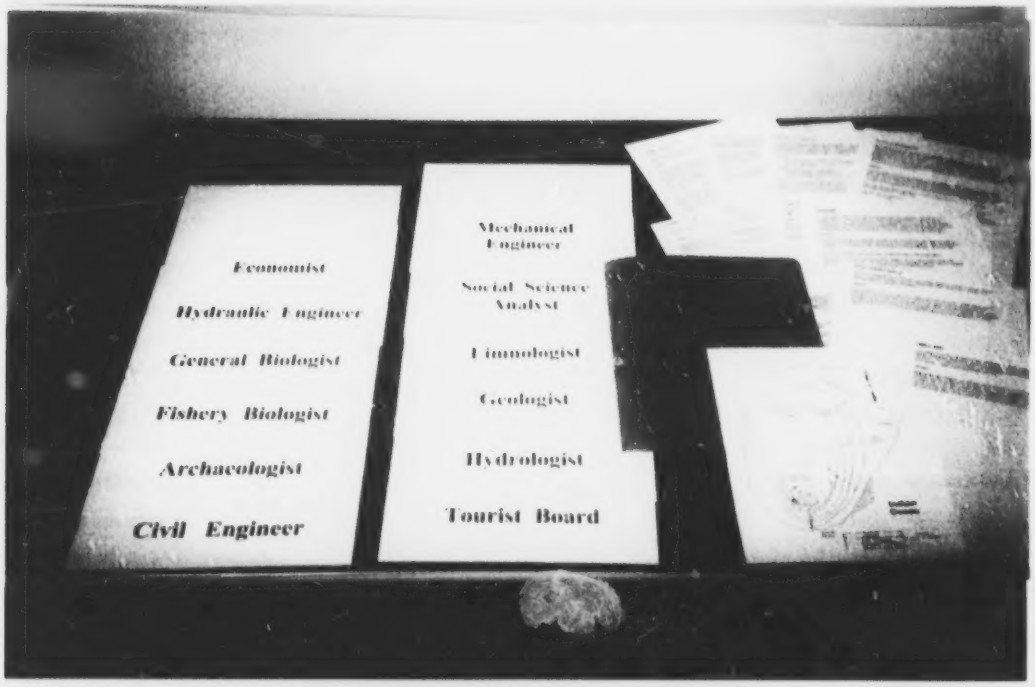
Typical Demonstration Length:

A minimum time is typically about 20 minutes to work through all the settings, although the kids can spend over an hour going back and forth through the settings to try to get the highest score possible.

Age Group:

Designed for 3 - 5 grade, but fun for all ages. Younger children will need the assistance of an adult to work the mouse, the keyboard, and help read the on-screen questions.

Credits: University of Nebraska Cooperative Extension, UNL Information Services, UNL Water Center/Environmental Programs, Papio-Missouri River NRD, Lower Platte South NRD, Nebraska Department of Environmental Quality, US EPA Region 7 (Section 319 Funds), Copyright 1997, Univ. of Nebraska, US EPA, Papio-Missouri River NRD



BLUE LAGOON

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BLUE LAGOON

Description:

The Blue Lagoon is an interactive 'game' where each participant represents a different group or interest on a remote island. Everyone is faced with a water use question. The basic premise is that the island has a limited supply of fresh water. A manufacturer, a major employer on the island, wants to increase their production which in turn means an increase in their water usage. Each student represents a different interest or scientific discipline on the island (factory manager, village elders, younger generation, tourism, hotel owners, a geologist, a biologist, a civil engineer, etc.) Each student is given a critical piece of information, available only to their interest group, concerning the proposed increase in water usage.

They play the game in a council setting, where the moderator/demonstrator guides the students through the process. Essentially the students run their own 'council meeting', select a council chair, call on the various experts and interests to state their viewpoint or provide their data. The 'council' then discusses the merits of the proposal, the pros and cons, the impacts of the proposal, mitigation actions, risks, etc. They must then arrive at some consensus of opinion and take a vote on the proposed action.

Typical Audience Size:

Not appropriate in a water festival setting
15 - 20 students (maximum) in a classroom setting

Typical Demonstration Length:

45 minutes (minimum) in a classroom setting
90 minutes (maximum) depending upon background of the audience, number of questions, number of options discussed, degree of participation of 'the council', etc.

Age Group:

All age groups from 5th grade through adult.

Water Is Life

U.S. DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

Make It Last

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PASS-THE-JUG

Description:

Pass-the-Jug is two interactive 'games' in one. In the first game, students are given name tags to wear that represent one of the over three dozen different water uses. Each student receives a plastic cup with a line drawn on it representing the amount of water 'needed' for their specific use. Water or soda is added to a jug (1-liter or 2-liter soda bottles can be used as well) and short pieces of string are tied to the jug. Each student holds the other end of one piece of string. The premise is that there is not enough water (or soda) to fill all the students' cups up to their lines - so the students have to decide how they are going to 'allocate' the limited resource. If the students decide that one of the represented uses is not necessary and will not receive any of the resource, then that student's piece of string is cut off. The students can debate the merits of each use, offer compromises, or come up with plans to allocate the resource based on consumptive and non-consumptive uses.

In the second game, students are given plastic cups with both a number and a line drawn on them. The number represents the student's water right 'priority', and the line represents that student's water right allocation (number '1' is the most senior water right priority, and the higher numbers are more junior priorities). A jug of water, or Kool-Aid, or soda is passed around the table and the students are allowed to fill their cups as full as they want. The only stipulation is that they fill the cups in numerical order as represented by their cups. Generally, there will not be enough 'resource' available for all the students to get some. The 'resource' is refilled and passed around again, only this time the students are only allowed to fill their cups up to the line drawn on the cup. The 'resource' can be filled to the brim to represent wet years or only partially filled to represent dry years. The third time the 'resource' is passed around, the students are encouraged to only take what they need, but not more than what they are allowed as indicated by the line on their cup. They can take less than that, or none at all if that is their choice. Usually, by this time the most junior water right holder will begin to get some of the resource.

The demonstration illustrates the concept of water rights, water allocations, conservation, water usage, and sharing.

Typical Audience Size:

5 - 8 students/participants in a water festival setting
15 - 20 students (maximum) in a classroom setting

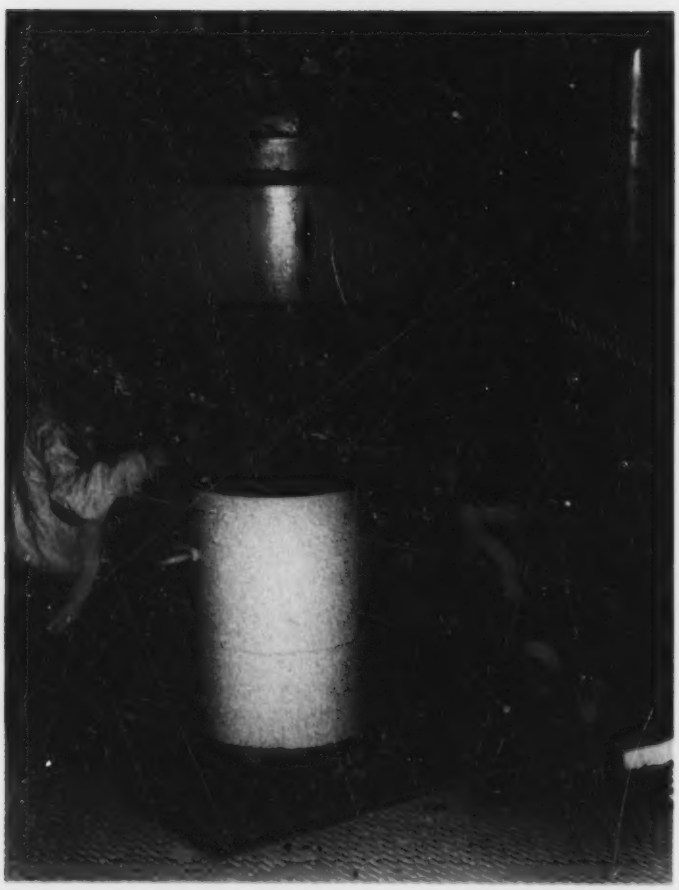
Typical Demonstration Length (for each game):

Variable in a water festival setting
20 minutes (minimum) in a classroom setting
40 minutes (maximum) depending upon background of the audience, number of questions, degree of participation of the audience, etc.

Age Group: All age groups from Kindergarten through adult. Demonstration can easily be tailored to meet the background level of the audience.

Notes: This demonstration is especially effective when the participants are thirsty, such as after a particularly enthusiastic activity, or on a warm day at an outside event.

ENVIRONMENTAL EDUCATION
SPECIAL PROGRAMS



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HYDRAULIC RESEARCH LABORATORY TOURS

Note: The hydraulic lab is an actual working laboratory.

Description:

A "general" tour of the research labs, for any USBR-Denver Office visitor, usually focuses primarily on the hydraulic research lab with side trips to the materials research lab, biological/ecological research and investigations displays, and other areas depending on the interest of the particular group.

When referring to the 'lab tours' as part of the Environmental Education Program, we are talking about a walking tour of the hydraulic research lab in Building 56 on the Denver Federal Center. This tour seeks to do the following:

- Describe the concepts of physical modeling,
- Give the students an overview of water resources management and the role of the Bureau of Reclamation in the western United States, as illustrated by the physical hydraulic models,
- Talk in very general terms, about the goals and objectives of one or two of the model studies.

All of this information is tailored to the needs of each individual group, considering the age group, interest level and attention spans.

Typical Demonstration Length:
25 minutes (minimum) - In comparison, a full-blown lab tour for adults would range from 1 - 1½ hours.

Age Group:
Fourth graders (approximately 10 years old) and above are recommended.

Typical Audience Size:
12 - (maximum)(8-10 is an ideal size)
One adult chaperone, besides the tour guide is required for each group.

Note: For safety reasons - awareness and caution should be always considered when entering or leaving the model or laboratory areas. As noted above, this is a walking tour. Please consider the needs of any students that may require additional assistance.

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STORM DRAIN/CURB STENCILING PROGRAM

Description:

This program is a pollution prevention program geared for elementary age students. Under the direction of the teacher, and through contacts at their local water department or facility, the children will stencil storm drains around their schools. There are different stencils, depending on the area and type of drain. One stencil states: DUMP NO WASTE-DRAINS TO RIVER, and the other DUMP NO WASTE-DRAINS TO STREAM. This program will teach the children that dumping motor oils, household cleaners, paint, etc., is polluting their drinking waters, killing fish and contaminating streams.

This program is highly successful in San Francisco, California, Washington, D.C., Boise, Idaho, and Seattle, Washington. Denver's program is a mirror image of Seattle's. The U.S. Bureau of Reclamation, the Environmental Protection Agency, along with the cities of Denver, Lakewood, and Aurora, Colorado, the League of Women Voters, and various school districts are participating in this program on a partnership basis.

While Reclamation provides all the supplies for the stenciling, the remaining partners provide the publicity in the form of public service announcements, and news releases and has received permission for the stenciling on the city curbs. Additionally, the schools are responsible for doing the actual stenciling.

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CLASSROOM VISITS

Description:

'Classroom Visits' involve one or more Reclamation Environmental Education Program staff members visiting a school, and presenting one or more of the demonstrations, activities, or programs. Typically, the staff member sets up in a classroom or lab, and the teachers bring their classes in for the program or demonstration. Class sizes range from 15-30 students; the grades range from Kindergarten through college. The background of the students can range from introductory level of knowledge of the topic to advanced.

These visits are generally coordinated with the science curriculum that the students are following. As such, the same presentation may be made several times a year at the same school, or a sequence of presentations may be made to the same students throughout the year.

The 'Classroom Visits Program' is often coordinated with the Partnership School Program.

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PARTNERSHIP SCHOOL PROGRAM

Description:

This program is designed to help individual schools learn a variety of subjects with the assistance from technical, scientific, and professional experts on a year-round basis. Generally, a Reclamation employee who participates in the Environmental Education Program (EEP) who has or knows a child or children in a school will act as the Program Coordinator/Liaison for that school. They will also organize all the events at the school with which the EEP helps. These may include lab tours, science fairs, mentoring, tutoring, special projects or field trips, special requests for outdoor recreation, and the usual Environmental Education programs on water, weather, geology, environment, etc.

This program is also assisting the school in acquiring good, used computers, software and some supplies for the classroom use.

TEACHER TRAINING

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TEACHER TRAINING
and
INTERACTIVE LEARNING MODELS AND DISPLAY LOAN PROGRAM

Description:

This program is designed to train local area science teachers in the use, care and presentation of Reclamation's Environmental Education Program (EEP) hands-on models and displays. The EEP's resources are lent to the trained teachers on an "as needed" and "as available" basis. Loans generally are for 1-2 days, sometimes up to 2 weeks, and if no conflicts arise, the loans can last for as long as one month. Models lent under this program are usually for a specific presentation or event that the teacher or school feels the EEP models would enhance their curriculum.

Though there is no cost to borrow the models, the teacher and/or the school is responsible for the cost of the maintenance and repair of any of the models while they have custody of them.

An experienced and trained EEP staff member will come to the classroom and train the teacher, giving advice, guidelines and background information on the specific model or models to be used. The model(s) can be left at this time with the teacher.

Only trained teachers will be permitted to borrow and keep the hands-on models for their classroom presentations. The models will only be lent to educational professionals, for educational programs.

WATER FESTIVALS

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WATER FESTIVALS

Description:

The Water Festival Program is similar in nature to many other programs. This program focuses on the many water festivals conducted throughout the year in the Front Range area.

Many local water districts, metropolitan water boards, etc., host water festivals every year for the school children, usually for 4th, 5th and 6th graders. Though the themes are slightly different each year, they are always water related.

Participants at the festivals in the past have included the U.S. Geological Survey (USGS), Fish and Wildlife Service (FWS), Bureau of Land Management (BLM), Soil Conservation Service, U.S. Department of Agriculture (USDA), Forest Service, the Environmental Protection Agency (EPA), local water users, waste-water treatment agencies, and other civil and government agencies. Reclamation participates at all local festivals through the Environmental Education Program as an invited exhibitor or instructor, usually presenting/demonstrating four or more of the activities, hands-on interactive demonstrations or providing exhibit hall displays.

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SPECIAL EVENTS

Description:

The Special Events Program concentrates on one-time only, or annual events that require special planning or long-term obligations. Such events include the State Fair, The News 4 Education Expo, Boy Scout Jamborees, Take Your Kid Fishing Days, Earth Day, special legislative events or programs, Bureau of Indian (BIA) Water Technician Training Program, science fair sponsors and/or judging.

This program is run very similarly to the Partnership School Program, Classroom Visits, and Water Festivals Programs. It can involve any of the activities, or hands-on demonstrations, any special discipline, and any level of volunteer participation.